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Subtract before you add: Towards the development of a de-implementation approach in school-based speech sound therapy

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Abstract

Purpose: It is often difficult for school-based speech-language pathologists (SLPs) to prioritize implementing new practices for children with speech sound disorders (SSDs), given burgeoning caseloads and the myriad of other workload tasks. We propose that de-implementation science (e.g., Davidson et al. 2017) is equally as important as implementation science. De-implementation science is the recognition and identification of areas that are of "low-value and wasteful" (Davidson et al., 2017, p. 463). Critically, the idea of de-implementation suggests that we first *remove* something from a clinician's workload before requesting that they learn and implement something new.

Method: Situated within the SHARE framework, we review de-implementation science and current speech-sound therapy literature to understand the mechanisms behind continuous use of practices that are no longer supported by science or legislation. We use vignettes to highlight real-life examples that clinicians may be facing in school-based settings and to provide hypothetical solutions, resources, and/ or next steps to these common challenges.

Results: We identified four primary practices that can be de-implemented to make space for new evidence-based techniques and approaches: 1) over-reliance on speech sound norms for eligibility determinations; 2) the omission of phonological processing skills within evaluations; 3) homogeneity of service delivery factors; and 4) the use of only one treatment approach for all children with SSDs.

Conclusions: School-based SLPs are busy, overwhelmed, and burned out (Marante & Farquharson, 2020). Although de-implementation will take work and may lead to some difficult discussions, the end result should be a reduction in SLPs' workloads and improved outcomes for children with speech sound disorders.

De-implementation science within school-based speech sound therapy

Implementation science can be seen as a dialogue between clinicians and researchers in which one of the goals is to best understand the facilitators and barriers for how evidence-based practices (EBP) are developed and adopted within specific contexts (Douglas & Burshnic, 2019). Germane to the present tutorial is a school-based setting, which is prone to substantial variability based on state-level guidelines (e.g., Farquharson & Boldini, 2017), age-groups (Brandel & Loeb, 2011; Katz et al., 2010), populations (Tambyraja et al., 2014; Yeager-Pelatti et al., 2019), and additional SLP-level factors (Swaminathan & Farquharson, 2018). Although the focus on implementation science in schools is imperative to ensure academic success for children with communication disorders, we propose that de-implementation science (e.g., Davidson et al. 2017) is equally important. De-implementation science is described as the recognition and identification of areas that are of "low-value and wasteful" (Davidson et al., 2017, p. 463). Critically, the idea of de-implementation suggests that we first *remove* something from a clinician's workload before requesting that they learn and implement something new. In what follows, we will focus on school-based therapy provided to children with speech sound disorders (SSD). Our goal is to focus on understanding some current common practices, to evaluate the science behind them, and then brainstorm ways to work toward improving SLPs' schedules, workloads, and overall therapy efficiency. Specifically, we will provide scientific examinations of four practices that are of lower-value, discuss factors that have potentially led to the maintenance of these practices, and suggest next steps to de-implement these practices. Both the practices and the factors will be contextualized within vignettes. The ultimate goal is to make space within the busy SLP's workday to consider the implementation of high-value practices, which will lead to improved outcomes for children with SSDs.

Implementation Science in Speech-Language Pathology

Implementation Science (IS) was borne out of the medical field, with an effort to understand how evidence-based practices impact patient care. One of the goals of IS is to identify barriers and facilitators to how new practices are implemented. Presently, we know that only 14% of original research is actually implemented into clinical practice, and it often takes 17 years or more to do so (Green, 2008). As such, the scientific mission of IS is to understand this gap between knowledge and practice to ultimately improve outcomes for patients.

In recent years, allied health fields, like speech-language pathology, have begun the process of applying IS frameworks and mindsets to clinical practice (e.g., Douglas et al., 2015). However, Douglas et al. (2021) highlighted that the SLP field is certainly still in the initial phases of integrating IS approaches into scholarship. IS has the potential to make a high impact on school-based settings and practices. Given the rise of caseloads and workloads, and an increase in burnout (Marante & Farquharson, 2021), it is not feasible to ask SLPs to take on more tasks and responsibilities, or learn and implement new practices without recognizing that something must first be removed from their proverbial "plate". In this way, we must simultaneously consider *de-implementation* within school-based settings. There is known inconsistency of terminology and how it is used to describe deimplementation across fields. Similar terms that have been used have included de-implementation, disinvestment, reallocation of resources, elimination, reduction, or restriction of practices (Harris et al., 2017; Lovett & Harrison, 2021). Inconsistency in terminology has made it difficult to focus on a single theoretical model on which to base our current recommendations regarding how to more effectively and more efficiently provide intervention services for children with SSD in school-based settings. We have thus adapted the Sustainability in Healthcare by Allocating Resources

Effectively (SHARE) model (Harris et al., 2017) and applied it to educational practices for children receiving SSD interventions.

The SHARE model, developed in the United Kingdom, aimed to investigate concepts, opportunities, methods, and implications for both the evidence-based investment and disinvestment in health services provided within a local healthcare setting. Specifically, the authors of SHARE have provided a framework for how de-implementation functions in healthcare settings such that resources are more effectively allocated to practices that are evidence-based. The SHARE model breaks down the process of de-implementation into two phases. Phase One involves identifying the need for change (Step 1) and developing a proposal for change (Step 2). Throughout Phase One, stakeholders consider a series of questions through investigation of the relevant scientific literature and perspectives of various stakeholders (e.g., clinicians, clients, administrators) to determine where change is needed and then develop a proposal that addresses the needs and/or concerns of all stakeholders. Phase Two involves carrying out the plans developed in Phase One and then evaluating the outcomes to determine the effectiveness of the proposal and its intended outcomes.

At present there is no known model of de-implementation that has been applied in educational settings for speech-language pathology practice. In prior research investigating school-based practices for SSD intervention, we have noted ineffective or inefficient practices as well as an overburdening of SLP workloads in school-based practice. As such, school-based intervention for children with SSDs is ripe for considerations of de-implementation, which may include removal, reduction, or restriction of certain common practices. We have adapted the SHARE model, which was developed for health care settings, to school-based speech-language pathology practices for children receiving SSD intervention. We chose this model for its

emphasis on sustainability of practice, relevant to school-based SLPs who experience burnout as a result of large caseloads and workloads (Marante & Farquharson, 2021). In addition, SHARE emphasizes the needs of multiple stakeholders such as the students, SLPs, and school administrators, to ensure the proper allocation of resources such as time, money, and expertise. The current paper represents Phase One of the adapted SHARE framework. We have reviewed the literature as well as results from surveys of school-based SLPs and identified several areas ripe for de-implementation (e.g., removal, reduction, restriction, or reallocation) to increase the sustainability of school-based practices for children receiving SSD intervention.

Low-value practices in school-based speech sound therapy

Situated within the SHARE framework, we present four practices that can be considered as "low-value". These four practices were chosen based on data provided by SLPs (Brandel & Frome Loeb, 2011; Cabbage et al., 2022; Mullen & Schooling, 2010; Farquharson & Boldini, 2018; Swaminathan & Farquharson, 2018; Farquharson et al., 2022; Farquharson & Tambyraja, 2019) and are: 1) overreliance on speech sound normative data; 2) omission of phonological processing and literacy during assessment; 3) homogeneity of service delivery factors; and 4) using the same treatment approach for all children. Each practice is described in turn and organized within Phase One of the SHARE framework. The first step of Phase One is to identify a need for change; the second step is to develop a proposal for change. Below, we first present the low-value practice contextualized within a vignette. Vignettes were designed to be reflective of everyday situations for school-based SLPs across the United States, and have been infused in the practices that we present above. However, we acknowledge that there is often substantial variability within and between states with regards to various aspects of clinical practice. Therefore, we invite our readers to infuse their own experiences into these vignettes as they see

fit for their individual situations. We do hope that our school-based SLP colleagues will see aspects of their own daily practice reflected in each vignette. Next, we present data from stakeholders indicating that there is a need for change. Finally, we offer thoughts towards the development of a proposal for change. These include potential barriers to changing this practice, and next steps, and/ or resources available to address the barriers and/ or a stronger high-value practice to replace it.

Over reliance on speech sound normative data.

Vignette 1

Robert is a first grader. Over the winter break, Robert's family moved from one side of a large city to another which resulted in Robert starting at a new school in. Just before the winter break, Robert was found eligible for speech therapy through special education for a SSD. Robert was unable to say any /ɹ/ or vocalic /ɹ/ sound and was not stimulable for prevocalic /ɹ/. The speech-language pathologist at the new school, Terry, follows the guidelines for how her district has interpreted the state guidelines for eligibility and thusdoes not pick up students like Robert for /ɹ/ therapy until the student has turned 8. Since Robert turned 6 over the summer, Terry used the 60 day interim period to reassess Robert. He achieved a standard score of 86 on the GFTA-3. Terry agreed with the previous therapist's assessment that he was not stimulable for pre-vocalic /ɹ/. Even though Terry wanted to continue Robert's services, she was not able to because of her school's guidelines for single sound errors. She also appreciates that her school's guidelines mean that she will not have another child on her ever-growing caseload. Terry explained to Robert's parents that he scored within the average range and that typically students are not seen for /ɹ/ unless they are closer to 8 years of age. Robert was found ineligible for services and Terry provided the parents with some handouts of things to do at home.

Identifying a need to change the use of speech sound norms. Vignette 1 is a very common practice in public schools across the US (Farquharson & Tambyraja, 2019). School systems often create eligibility criteria that are not an accurate representation of the research literature, but put in place to manage caseload sizes for the SLPs. This results in children like Robert not receiving the services that they need and are entitled to under the federal law (Ireland et al., 2020). When surveyed, 37% of school-based SLPs reported that there were children who they believed should be receiving services, but who did not qualify due to the school system's mandated eligibility criteria (Farquharson & Tambyraja, 2019). There is a need to change how school-systems interpret and use speech sound normative data. These data are reflective of average ages of acquisition for individual phonemes within a language, and are based upon typically developing children. Speech sound norms were not created for diagnosing an SSD, but are often used as the sole or primary determinant as to whether or not a child receives special education and/ or related services (Storkel, 2019). There are three additional problems with the overreliance on speech sound norms: 1) they do not consider the type of error that the child is making, but focus only on the target sound; 2) they do not take into account the wide range of variability with respect to age of acquisition; and 3) they do not consider the negative real-world effects that speech sound production may be having on a child's daily life.

It can be problematic to focus solely on the target speech sound, instead of the type of error that the child is making. For instance, the phoneme /s/ is typically acquired by age 5 (Crowe & McLeod, 2020). An ineffective application of this information would suggest that no child younger than 5-years-old should receive speech sound therapy to improve production of the /s/ sound. However, if the child is producing a lateral fricative /ɬ/ instead of /s/ (i.e., a lateral lisp), then treatment is often recommended much earlier than 5 (Dodd et al., 2018; Smit et al.,

1990). By contrast, if the child is producing /θ/ instead of /s/ (i.e., a frontal lisp), and they have recently lost their two front teeth, then it would be unlikely that treatment would be recommended at age 5. In this situation, the clinician would need to have the clinical-decision making latitude to provide services for a child with a lateral lisp, but plan to rescreen the child with the frontal lisp. In sum - it matters less what the target sound is and more what the child's error is. That can only be determined by a skilled clinician who has the space within their practice to make child-centered decisions. The alternative is an ineffective practice in which children are denied services, which can result in social-emotional difficulties over time (Krueger, 2019; McKinnon et al., 1986).

An overreliance on speech sound norms is further problematic because, for some sounds, there is a wide variation in the range for acquisition in typical development. Ironically, one of the most commonly used sources of speech sound acquisition data, as seen in Vignette 1, comes from Sander (1972); however, Sander himself explicitly stated that a single age cannot be associated with each consonant phoneme. Perhaps most alarming, Storkel (2019) noted that "the most diagnostically accurate cutoff for any set of norms is unknown" (p. 68). That is, there is little to no diagnostic accuracy in the application of speech sound norms for eligibility purposes. This presents an opportunity for systematic decisions regarding disinvestment (Harris et al., 2017). Overreliance on speech sound norms does not integrate data from a more comprehensive evaluation, it does not allow for critical thinking on behalf of the clinician, and it often withholds services from children who are entitled to them under both the Individuals with Disabilities Education Act (IDEA) and Free Appropriate Public Education (FAPE).

Towards the development of a proposal to change the use of speech sound norms.

Many states and districts require that SLPs make a determination for eligibility based solely on

when a speech sound is reported to develop (Farquharson & Stevenson, 2019). In some situations, this is done as a means of controlling caseload sizes. That is, children who are exhibiting difficulty producing a particular speech sound are not fully evaluated, or determined to be eligible for services until a particular age. This is problematic for the reasons outlined above. It also only temporarily alleviates caseload growth, because those children may eventually require direct services and by the time the child is 8-years-old or older, the speech sound error maybe more difficult to treat (Krueger & Storkel, 2022; To et al., 2022). Moreover, an increasing body of evidence suggests that even very young children are able to acquire later-developing sounds with treatment (Gierut et al., 1996; Krueger & Storkel, 2022).

Additional barriers to changing this practice are related to the extreme variability in how speech sound normative data are used within and between states (e.g., Farquharson & Stevenson, 2021). Farquharson and Stevenson (2021) reported an example from the state of Montana, which specifies that children can be considered eligible for services if they have difficulty with a speech sound that 90% of same-aged children have acquired. The Montana guidelines make reference to 'developmental norms', but do not specify which norms should be used. This leaves room for ineffective practices, as many speech sound norms are either outdated or geographically irrelevant. That is, Farquharson and Stevenson (2021) reported that the majority of SLPs in their sample indicated using the Iowa-Nebraska norms (Smit et al., 1990). However, there are substantial variations in race, ethnicity, culture, accent, and dialect within and between states. Using data that is not normed on the same geographical region in which a child is living or being assessed creates a biased process that is likely to preclude services.

Resources to address these barriers. The benefit of using speech sound norms for eligibility as a means of caseload control does not weigh up to the cost of children not receiving

necessary services. Considering /ɹ/ is a frequently occurring sound in the English language (Barker, 1960; Hayden, 1950) and treatment for /ɹ/ has proven effective as early as 4-years-old (Krueger & Storkel, 2022), it seems prudent to begin intervention for /ɹ/ as early as kindergarten. Intervening early will prevent prolonged habituation of inadequate motor patterns, foster development of distinct phonological representations of errored sounds, and mitigate the onset of literacy deficits frequently observed in children with SSDs (Cabbage et al, 2018).

An important next step in overcoming this barrier is to not rely heavily on standardized scores from speech production assessments. As illustrated in Vignette 1, a standardized score of 86 on the GFTA-3 was not "low enough" for Terry to qualify Robert. Relying solely on test scores and cut-points or norms fail to provide a clear picture of how speech sound errors may be impacting a child across academic, social, and emotional domains. The guidelines contained in IDEA (2004) are clear that evaluations for special education should be comprehensive using "a variety of assessment tools and strategies to gather relevant functional, developmental, and academic information, including information provided by the parent" (IDEA, 2004, §1414, (b)(2)) and address all areas of "suspected disability" (IDEA, 2004, §1414, (b)(3)(B)). When a child presents with any speech sound error, the SLP should also assess phonology and consider how the child's errors may be impacting reading and spelling (explained in further detail below). In a study of preschoolers with SSD, Macrae and colleagues (2014) examined the relationships between word and speech error variability other language measures. They found a negative correlation between a child's speech error variability and performance on a syllable repetition task. That is, the more variability in a child's speech errors, the poorer their performance on a syllable repetition task. Macrae et al. (2014) posited that this negative relationship may be an outward sign of a child's unclear phonological representation. Indistinctive phonological

representations place a child at risk for later reading and spelling difficulties. Rather than only using a standardized score to assess a child's speech sound production, SLPs can also collect a conversational speech sample which can be used to analyze percentage of consonants correct (PCC; Shriberg & Kwiatkowski, 1982; Shriberg, et al. 1986) and compare the child's connected speech to single word elicitation (from standardized measures). In addition to obtaining PCC, a child's phonetic inventory in connected speech can be compared to consonant acquisition data (Crowe & McLeod, 2020). A student's stimulability should also be a factor when determining eligibility. To et al. (2022) found children who were stimulable for correct speech sound production achieved correct production quicker and without therapy compared to children who were not stimulable. As such, children who are not stimulable are the ones who require direct services (Miccio et al., 1999; Powell, 2003). A more comprehensive assessment provides a fuller picture of a child's production abilities rather than relying solely on a standardized score. In Vignette 2, only considering the standardized score on an articulation test like the Goldman-Fristoe Test of Articulation, Third Edition (GFTA-3), would fail to capture any difficulties with speech perception (e.g., being unable to hear the difference between the words *rake* and *wake*), phonological issues, or spelling difficulties. In addition, the lack of stimulability for the /ɹ/ sound provides an indication that Robert is unlikely to develop the sound without direct treatment.

Omission of phonological processing and literacy during assessment.

Vignette 2

Amy is a new Clinical Fellow (CF) working at a public school in Delaware. The district in which Amy was hired provided training to all new special education staff on their IEP software and the special education director provided an overview of the Delaware Administrative Code (2021)

regarding special education services, including eligibility. Amy looked up the regulations after the meeting to get more information and noted the following:

- For all communication impairments the difficulty must be moderate to severe and adversely affect the child's educational performance to be eligible
- If applicable, MTSS must be followed
- For speech sound disorders, the impairment is of sounds considered to be developmentally appropriate for the child's age or cultural linguistic background
- For speech sound disorders, an oral peripheral examination is required

Amy looked at another part of the law to gain better understanding of "adverse effect on educational performance". It said:

> "**Adverse Effect on Educational Performance**" means a significant and consistent negative influence of the disability on the student's educational performance, as evidenced by their skills in the academic, developmental, or functional domains (e.g. literacy, mathematics, adaptive skills, mobility, pre-vocational and vocational skills, behavior, social/emotional adaptation, self-help skills, and communication).

Amy thought the eligibility criteria (moderate to severe classification AND adverse effect on educational performance) was in contrast to the statement about education performance. A speech sound error on a single sound, like /ɹ/, may not be categorized as moderate or severe, but it could absolutely have a "significant and consistent negative influence" on a student's communication. During preplanning, she asked the other SLP at her school how she interpreted the state's guidelines. Her coworker indicated she would complete a single-word articulation test first and if the standard score did not fall in the moderate (typically 77-71 or 1.5 to 2.0 SD) to

severe range (70 and below or 2.0 SD or below) she would not recommend eligibility. Amy asked how the coworker determines if the speech sound errors are affecting educational performance. The coworker indicated that since the referral from the teacher was related to speech sound difficulties, that is all the coworker was testing.

Identifying a need for changing how phonological processing and literacy are included in assessments. Vignette 2 presents a scenario of a school-based SLP who is puzzled by how "educational performance" can be determined without actual data from the classroom setting. As discussed above, SLPs must acknowledge how children's speech sound production abilities impact their educational performance (Ireland et al., 2020). This means that single-word articulation tests and developmental norms (see Vignette 1) should only represent one aspect of the SSD evaluation process. As such, SLPs must consider children's educational performance in academic and social-emotional domains. The extant literature indicates that children with SSDs are subject to difficulties with literacy attainment (Raitano et al., 2004; Tambyraja et al., 2022), spelling (Farquharson, 2019; Hayiou-Thomas et al., 2016; Lewis et al., 2002, 2000), working memory (Farquharson et al., 2017), speech perception (Cabbage et al., 2015, 2016; Hearnshaw et al., 2018; Shuster, 1998), and social-emotional well-being (Hall, 1991; Krueger, 2019). Furthermore, even children with a limited number of speech sound errors are susceptible to a myriad of academic and social consequences (Hitchcock et al., 2015). However, current practices often do not include measures of literacy (Farquharson & Tambyraja, 2019), phonological processing, or social-emotional well-being. Without that information, there is often not enough data to confer the appropriate diagnosis to better differentiate intervention, or make a data-based decision regarding eligibility for services under IDEA legislation.

Towards the development of a proposal to change how phonological processing and literacy are included in assessments.

The severity of SSD is not always indicative of children's reading outcomes (Hayiou-Thomas et al., 2016; Tambyraja et al., 2022). For example, Tambyraja and colleagues (2022) examined the phonological processing abilities of children classified as poor or good readers. Results revealed that the severity of SSD, measured by PCC, failed to differentiate between children in the poor and good reader groups. Of note, however, poor readers were more likely to demonstrate deficits in all three measures of phonological processing: phonological awareness, rapid automatic naming, and verbal short-term memory. Reading dysfunction associated with phonological processing deficits is not limited to early childhood. Indeed, Preston and Edwards (2007) reported that adolescents with few residual speech sound errors evidenced weakened phonological processing skills compared to peers matched for age and receptive vocabulary abilities. The authors posited that indistinctive phonological representations likely contributed to the participants' residual errors and phonological processing deficits. This postulation is supported by Anthony et al. (2011) and Sutherland and Gillon (2005), who conferred imprecise phonological representations contributed to weaknesses in phonological awareness and reading development in children diagnosed with SSD.

Of clinical significance, spelling abilities are highly correlated with measures of phonological processing (Lewis et al., 2002). Furthermore, an investigation of 4-to-6-year-old children with moderate-to-severe SSD revealed that measures of phonological processing predicted school-age spelling and reading abilities (Lewis et al., 2000). Farquharson (2019) illustrated how childhood SSD could affect spelling proficiency upon completing a case study on two children with mild SSD. In particular, one participant named Nathan demonstrated a mild

articulation disorder characterized by a single substitution error of /f/ for /θ/. Nathan was asked to spell ten words, all of which began with his target sound of /θ/. An analysis of his spelling test results revealed that Nathan substituted /f/ for /θ/ on 9/10 words (e.g., "fin" for thin; "fre" for three). These findings signify that Nathan's phonological representation for /θ/ is indeed inaccurate and represented by /f/. This scenario underscores that SSDs can adversely affect children's spelling abilities, regardless of SSD severity. That is, young children with a single speech sound error are susceptible to issues beyond the scope of disordered expressive phonology.

More evidence regarding the impact of SSD on spelling abilities can be drawn from Hayiou-Thomas et al.'s (2016) longitudinal analysis of the connection between early SSD and subsequent literacy outcomes. The researchers reported that an SSD diagnosis at 3.5 was associated with risk of poor phonemic awareness and spelling abilities at 5.5 and reduced word reading proficiency at age 8. This finding is not surprising considering the documented relationship between phonemic awareness and spelling (Lewis et al., 2002) and that early phonological processing skills are highly predictive of later reading development (Wagner & Torgesen, 1987). Of more clinical concern, though, some children with concomitant SSD and language impairment continue to experience spelling and reading difficulties as they progress through school and even into adulthood (Lewis & Freebairn, 1992).

Resources to address these barriers. The connection between speech sound production and word reading/ spelling ability presents an important opportunity for collaboration with other educational professionals. These referrals, even if called “speech only” still must include an IEP team. SLPs are not individually responsible for eligibility determinations, they are part of a multi-disciplinary assessment team (Farquharson et al., 2021). For instance, classroom teachers

often have quick access to in-class assignments that reflect the child's phonological processing skills, such as reading or spelling tests. These assignments have already been completed, and are based upon the curriculum, so this should not add an undue burden on an SLP's workload. It is also prudent to include measures of all three components of phonological processing into the SSD assessment battery (phonological awareness, rapid automatic naming, and verbal short-term memory; Tambyraja et al., 2022). For these data, SLPs like Amy and her coworkers (Vignette 2) can consider collaborating with the educational psychologist in the district. This reallocation of responsibilities ultimately results in more comprehensive assessments, allowing for robust clinical decision-making. An early indicator of phonological processing abilities will provide the IEP team with critical insight regarding children's literacy development, which, in turn, may forewarn if routine monitoring of students' reading acquisition is warranted. This helps to keep the child's needs at the center of the eligibility process (see Farquharson et al., 2021 for a tutorial on human-centered designs for eligibility).

Homogeneity of service delivery factors

Vignette 3

Micah works at an elementary school with approximately 800 students. There are roughly 80 students that have IEPs with speech and language goals. Currently, Micah is the only SLP at the school. In an effort to create more time in the week for other tasks, Micah goes to the principal with an idea. Rather than providing standard 30-minute sessions once or twice weekly for students with speech sound goals, Micah would like to schedule using minutes per month and see those students for several small chunks of time during the week. A program like Speedy Speech or SATPAC would be used. Micah is thinking services in the IEP can be written as minutes per month (e.g., 60 minutes/month). This more than covers the time spent with students and will

allow for slightly longer sessions (5-10 minutes) when introducing a new sound or much shorter sessions (2-3 minutes) when working on drill. This approach will be used for those students that have single sound errors that do not require more intensive approaches (e.g., cycles, DTTC, etc.). The principal is worried this will be too disruptive to teachers and is reluctant to give their approval. Micah has talked to the 3rd grade teachers about the idea and they are willing to try because it means students are missing less class time. Micah also can schedule time for this pilot idea when students are not in language arts or math instruction. Micah shares with the principal that the parents of the 3rd grade students are willing to amend their child's IEP with the time change to services for a trial period of 4 months with the understanding that it will be changed if they are not satisfied with their child's progress. Micah shares with the principal the research behind approaches like Speedy Speech and SATPAC, confident that these students could make the progress needed to meet their speech sound goals (and for several of the students it would mean dismissal from special education). The principal agrees to let Micah move forward with the plan for the next four months and revisit at that time.

Identifying a need for change in service delivery. Micah needs a way to diversify service delivery options. Micah has a large caseload size, at 80 children. According to the 2022 ASHA Schools Survey (ASHA, 2022), school-based SLPs most frequently reported a caseload size of 50 students (M = 48.5, SD = 17.7) across all school-based settings including day school, preschool, elementary, and secondary settings. This represents a slight increase from the 2020 ASHA Schools Survey which reported the most frequently reported caseload of 45 students (M = 48.0, SD = 18.5; ASHA, 2020). With ever-increasing caseload numbers, SLPs like Micah continue to be faced with significant time and resource demands that may present a challenge when making service delivery decisions. Such service delivery factors include the location of the

therapy (e.g., pull-out versus classroom-based intervention), the size of the therapy group (e.g., individual versus group therapy), the frequency of therapy sessions (e.g., once or twice per week), the duration of therapy sessions (e.g., shorter, more frequent versus longer, less frequent), and dosage of each session (e.g., number of trials per session). Despite the likelihood that children would benefit from individualized consideration for each of these service delivery factors (Brandel & Frome Loeb, 2011), research suggests that other factors such as excessive caseload size and/or scheduling constraints, rather than individual needs, may more readily dictate these decisions (Brandel, 2020; Katz et al., 2010). In this way, the use of one service delivery approach is an ineffective practice, as it does not allow for individualized tailoring to the child's needs.

The National Outcomes Measurement System (NOMS) database revealed that school-based SLPs most frequently serve children with a pull-out service delivery model which involves providing services in an individual or small-group setting outside of the context of the classroom (Mullen & Schooling, 2010). Specifically, in K-12 settings, 97.5% of all children receiving speech sound production therapy were served in pull-out settings (Mullen & Schooling, 2010), and in Pre-K settings, 25.1% of children received individual pull-out therapy services and 62.6% received group treatment. Note that group size, and whether or not the groups included mixed abilities and ages is not specified. SLPs in the United Statesreport that 74.06% of all students received therapy services outside of the classroom (Brandel & Frome Loeb, 2011). However, these same SLPs did not indicate whether this service delivery varied according to the child's area of need (e.g., speech sound production, morphosyntax; Brandel & Frome Loeb, 2011). While such pull-out therapy may be appropriate for children that require individualized instruction in speech sound production, further analysis reveals that the vast majority of these

children are being served in group therapy sessions ranging from 2-6 students in size. Mullen and Schooling (2010) reported that only 9.4% of K-12 children receiving speech sound therapy received individual pull-out services, with the majority (81.7%) being seen in groups of 2-4 children. For preschool-aged children, 62.6% received group-based services, although the number of children in said groups was not reported.

Despite the ubiquitous practice of providing speech sound therapy in groups, there is critically little evidence supporting the benefit or limitations of doing so. In fact, the majority of SSD intervention research is conducted with individual children in clinical or lab-based settings, further limiting the application of its efficacy to school-based settings. That said, Farquharson et al. (2022) recently revealed that for a sample of 106 school-based SLPs serving children with SSDs, as group size increased, children in the group produced, on average, 13 fewer trials per session. The number of trials produced per session, also known as dosage, is a factor that has been shown to positively correlate with treatment outcomes (Edeal & Gildersleeve-Neumann, 2011; Rvachew & Matthews, 2019). Current recommendations suggest that more trials per session result in more positive outcomes (Williams, 2012). The range of trials needed to see such a benefit has ranged from 50 to 100. Taken together, these findings suggest the benefit of encouraging therapy sessions with high dosage for the most positive outcomes. The findings from Farquharson et al (2022) are among the first to demonstrate the specific effect of group size on dosage but further research is needed to determine the impact of group size on speech sound production outcomes.

Towards the development of a proposal for changing service delivery. School-based SLPs face a variety of obstacles toward effective service delivery implementation. In addition to the time and resource demands, there is also a critical lack of research investigating speech sound

therapy outcomes in clinically relevant settings such as schools. Recently, a handful of studies have begun to investigate alternative service delivery methods to the traditional pull-out model for speech sound production therapy and to determine whether these alternative service delivery models have equivalent, poorer, or improved outcomes for children with SSDs in the schools (Brousseau-Lapre & Greenwell, 2019; Bruce et al., 2018; Mire & Montgomery, 2009; Swaminathan & Farquharson, 2018; Taps, 2008). These approaches aim to incorporate principles of motor learning which suggest that shorter, frequent sessions are more beneficial for speech sound outcomes than longer, less frequent therapy sessions (Taps, 2008). This is illustrated with Micah in Vignette 3. Micah approaches their principal with a suggestion to use "minutes per month", so that there is flexibility in both session duration and frequency. In Micah's situation, they worked with 3rd grade teachers to ensure that this change in service delivery was also acceptable for scheduling purposes.

Scheduling presents a particular challenge for school-based SLPs as there are often constraints for when and how long a child can be out of the classroom. Because of such constraints, clinicians and researchers alike have aimed to creatively address speech sound production errors more effectively and efficiently. The 2004 reauthorization of the IDEA introduced a method of service delivery called *response to intervention* (RTI), more recently termed *multitiered systems of support* (MTSS), designed to provide increasingly intensive and specialized instruction (Ireland et al., 2020; Ukrainetz, 2006). While MTSS has more frequently been applied to children struggling in academic areas, recently it has been used by school-based SLPs to preventatively address speech sound errors in children who do not yet quality for special education services and an individualized education plan (IEP; Bruce et al., 2018; Mire & Montgomery, 2000; Taps, 2008). Using an MTSS service delivery model involves identifying

children in a classroom making speech sound errors but do not yet appear eligible for speech services because of eligibility factors (Ireland et al., 2020). One tier of support for these children may include small-group instruction in the classroom, or short individual sessions in the classroom or in the hallway outside the classroom. These methods can be effective in reducing the overall intervention time (Bruce et al., 2018; Mire & Montgomery, 2009) and even shortening overall time spent in therapy for children who ultimately qualify for an IEP targeting speech sound production. Although not ubiquitously used in the field yet, Swaminathan and Farquharson (2018) queried 575 school-based SLPs in the United States and found that approximately 47% used an RTI model for addressing speech sound errors in children. This is encouraging as it suggests that SLPs increasingly see RTI as a feasible service delivery option for treating children with SSDs. Despite increasing evidence that alternate service delivery models such as MTSS may be beneficial for children with SSDs, school-based SLPs may face resistance to a change in how speech therapy is provided from other educators or administrators. We believe, however, with a review of the resources below and proper advocacy, SLPs can help effect change that will ultimately benefit children with SSDs and help SLPs manage high caseloads.

Resources to address these barriers. There are several alternate service delivery options to a traditional pull-out model for school-based speech sound production therapy (Brousseau-Lapre & Greenwell, 2019; Bruce et al., 2018; Mire & Montgomery, 2009; Taps, 2008). This includes how to implement MTSS for children with speech sound errors in authentic school settings. For example, Brosseau-Lapre and Greenwell (2019) describe a Quick Articulation! Program, which runs for an 8-week period and serves kindergarten students. Each child receives individual therapy for 10 minutes and targeting two phonemes; five minutes and 50 trials for

each sound). Some children make rapid progress and are dismissed after the 8 weeks. Some children repeat the 8-week cycle two or three times. Overall, most kindergarteners have resolved their speech sound errors by the end of the academic year. SLPs may decide to share the research with school district administrators and teachers to help justify a change in traditional service delivery to improve the overall effectiveness of speech sound intervention for children. Further information regarding how to advocate for better service delivery practices can also be found in Farquharson et al. (2022) and Marante & Farquharson (2021).

Using a restricted number of approaches to treat children with SSD

Vignette 4

Marco and Leah are in the same kindergarten class and their SLP, Maggie, pulls them out of class together at the same time to provide their required IEP minutes for speech services. Marco exhibits several phonological pattern errors including fronting, stopping, deaffrication, and cluster reduction. Leah produces lateralized productions for /s/, /z/, /ʃ/, /tʃ/, and /dʒ/. Because they both have errors on the /s/ phoneme (e.g., stopping for Marco, lateralization for Leah), Maggie targets /s/ in isolation to establish accurate /s/ production. Marco picks this up very quickly and Leah has more difficulty. Eventually, Maggie starts working on /s/ in initial positions of words for both children. She is noting that Leah is steadily increasing her accuracy of /s/ production in initial positions of words but Marco continues to have difficulty accurately producing words with initial /s/, even though he able to produce /s/ in isolation with ease. Often, when he attempts a word with initial /s/, he will produce an /s/ and then follow it with a stopped production of the target word (e.g., says /s/ + /tʌn/ instead of /sʌn/ for “sun”). Maggie is concerned because of Marco’s lack of progress.

Identifying a need for changing treatment approaches. In Vignette 4, the SLP may feel limited by both the IEP minutes and the scheduling requirements of the school. Initial thoughts may be to adapt the IEP minutes for Marco, or to change the schedule to see Marco individually. However, there are other options for reallocating the time that Marco spends in therapy. Because children with SSD comprise a heterogeneous population of children, there are a variety of options for treating their needs. There are different subtypes of SSD (e.g., sensory-motor articulation deficits, phonological deficits, motor programming deficits, etc.), variations in in severity (e.g., 1-2 mild distortions versus highly unintelligible), that occur across a wide range in ages (e.g., preschool-aged through adolescence). Such variability suggests the need for differentiated therapy approaches to maximize outcomes for children with varying needs (Baker et al., 2018). However, despite the existence of more than 40 named approaches to treat SSDs in children (see Baker & McLeod, 2011a; 2011b for review), most SLPs report utilizing a limited number of SSD approaches with children on their caseloads (Brumbaugh & Smit, 2013; Cabbage et al., 2022; Joffe & Pring, 2008; McLeod & Baker, 2014).

Recently, Cabbage and colleagues (2022) conducted an in situ survey with 106 school-based SLPs in the United States across 42 different states. Participants were queried three times per day for one workweek to gather real-time feedback on the intervention they used with children with SSD on their caseloads. Findings revealed that, by and large, SLPs utilized a restricted number of approaches, strongly favoring a traditional articulation approach for children in K-12 settings (reported in 33% of all sessions). The next most frequently reported approach was the use of minimal pairs, which was reported in 13% of sessions followed by the use of the cycles approach, which was reported in 11% of sessions. This is in alignment with previous reports. Brumbaugh and Smit surveyed SLPs serving children ages 3-6 years and similarly

found the most commonly used approach was the traditional articulation approach, reported by 49% of participating SLPs as using it always or almost always. These same SLPs also reported using phonological awareness, minimal pairs, and cycles. While both of these studies were conducted in the United States, surveys from the United Kingdom (Joffe & Pring, 2008) and Australia (McLeod & Baker, 2014) have similarly found that SLPs tend to use a restricted number of approaches to treat children with SSD. This is an inefficient practice because pairing the inappropriate treatment approach with a child will result in protracted time in therapy. This not only poses ethical and legal concerns, but is financially draining on school-systems.

Despite clinicians utilizing a restricted number of approaches, the diversity of SSDs and children who exhibit SSDs suggests that there is not a single gold standard approach that works for all children (Kamhi, 2006). Importantly, subtypes of SSDs have hypothesized differences in their underlying deficits (e.g., sensory-motor deficits in articulation-based errors, cognitive-linguistic deficits for children with phonologically-based errors), thus there is theoretical reason to address these deficits using different approaches.

Towards the development of a proposal for changing treatment approaches. School-based SLPs are faced with significant limitations on both time and resources and differentiating interventions for individual children with SSDs is especially challenging in school-based settings. High caseloads and limited availability of students due to curriculum demands can result in scheduling constraints that make diversifying intervention difficult. Moreover, school-based SLPs are typically generalists in their clinical practice, working with children with a wide range of communication disorders affecting multiple domains, including but not limited to: SSDs, developmental language disorder, autism spectrum disorder, fluency disorder, and others, all of which require differentiated intervention to address each child's needs. It is thus

impractical to expect school-based SLPs to develop extensive expertise across a myriad of intervention approaches for multiple populations of students. Given the large number of children with SSD on SLP caseloads in school-based settings (ASHA, 2022), school administrators should prioritize continuing education for SLPs, so that clinicians can maximize outcomes for children with SSD. As a result, this initial time investment has the potential to have long-term impacts on overall SLP workload demands.

Resources to address these barriers. Since the etiology of SSD and the type of errors widely vary in children with SSD, SLPs must employ a comprehensive assessment for differential diagnosis of a child's SSD. Such differential diagnosis includes determining factors such as the type of errors children are producing such as single articulation errors or the usage of multiple phonological patterns (e.g., Preston et al., 2013), the presence or absence of motor programming deficits suggesting a diagnosis of childhood apraxia of speech (see Murray et al., 2015 for helpful assessment tasks that do this), and/or whether additional phonological deficits beyond speech production (e.g., literacy, phonological processing) are present (see Cabbage et al., 2018 for additional information). Proper differential diagnosis will help guide clinical decision-making that can more holistically address a child's underlying deficit. This would aid the SLP in Vignette 4 in ensuring that they were providing Marco with individually-tailored treatment.

There are several reviews of a wide variety of SSD intervention approaches (Baker & McLeod, 2011; Baker et al., 2018; Cabbage & DeVeney, 2020; Williams, 2010) including those that discuss intervention approaches particularly suited for use in school-based settings (Cabbage & DeVeney, 2020). While it is impractical for SLPs to master implementation of all SSD intervention approaches available, we suggest SLPs start with learning at least one new

phonologically-focused approach and one new motor-based approach. For example, an SLP may have a student on his/her caseload that has plateaued or has simply struggled to make progress in speech sound development. Resources that differentiate interventions by how specific underlying deficits are targeted (Cabbage & DeVeney, 2020) may introduce the SLP to a new approach that can be learned and attempted. After a few years, with such systematic learning, SLPs can relatively quickly broaden their knowledge of available intervention approaches. Ultimately, the school system's financial investment in SLPs' continuing education will save time and money as clinicians will be able to more quickly and effectively provide treatment to children.

Conclusion

School-based SLPs are busy, overwhelmed, and burned out (Marante & Farquharson, 2020). The implementation of best practices is their goal, and they seek professional development every year to improve their skill set. However, until school-based systems allow for the de-implementation of low-value practices that are ineffective and inefficient, it will continue to be challenging to add any new activities. We must subtract the low-value practices before we can add high-value practices. Re-evaluation of dated practices may reveal that these practices have been maintained due to "lack of up-to-date knowledge, clinical inertia, habit, or legal fears" (Davidson et al., 2017, p. 466).. Next steps within the SHARE framework will be to move into Phase 2. In this phase, clinicians and researchers implement the proposed changes and evaluate the outcomes. This process is iterative. Although de-implementation will take work and may lead to some difficult discussions, the end result should be a reduction in SLPs' workloads and improved outcomes for children with SSDs

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